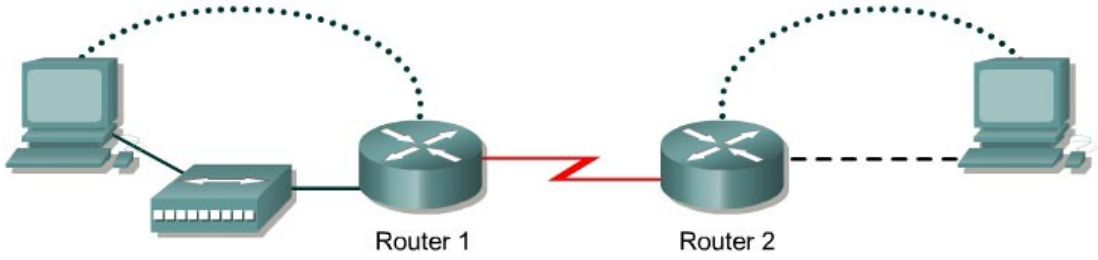
Lab 9.3.5 Troubleshooting Routing Issues with `show ip route` and `show ip protocols` – Instructor Version 2500



Router Designation	Router Name	Fast Ethernet 0 Address	Interface type	Serial 0 Address	Subnet mask for both interfaces	Enable secret password	Enable, VTY and console password
Router 1	GAD	192.168.1.1	DCE	192.168.2.1	255.255.255.0	class	cisco
Router 2	BHM	192.168.3.1	DTE	192.168.2.2	255.255.255.0	class	cisco

Objective

- Use the **`show ip route`** and **`show ip protocol`** commands to diagnose a routing configuration problem.

Background/Preparation

Cable a network similar to the one in the diagram. Any router that meets the interface requirements displayed on the above diagram, such as 800, 1600, 1700, 2500, 2600 routers, or a combination, may be used. Please refer to the chart at the end of the lab to correctly identify the interface identifiers to be used based on the equipment in the lab. The configuration output used in this lab is produced from 1721 series routers. Any other router used may produce a slightly different output. The following steps are intended to be executed on each router unless specifically instructed otherwise.

Start a HyperTerminal session as performed in the Establishing a HyperTerminal session lab.

Note: Go to the erase and reload instructions at the end of this lab. Perform those steps on all routers in this lab assignment before continuing.

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Step 1 Configure the hostname, passwords and interfaces on the GAD router

a. On the GAD router, enter the global configuration mode and configure the hostname as shown in the chart. Then configure the console, virtual terminal and enable passwords. If there is a problem doing this, refer to the Configuring Router Passwords lab. Configure interfaces as shown in the table.

Step 2 Configure the routing protocol on the GAD router

a. Go to the proper command mode and enter the following:

```
GAD(config)#router rip
GAD(config-router)#network 192.168.1.0
GAD(config-router)#network 192.168.2.0
GAD(config-router)#exit
GAD(config)#exit
```

Step 3 Save the GAD router configuration

```
GAD#copy running-config startup-config
Destination filename [startup-config]? [Enter]
```

Step 4 Configure the hostname and passwords on the BHM router

a. On the BHM router, enter the global configuration mode and configure the hostname as shown in the chart. Then configure the console, virtual terminal and enable passwords. Finally, configure the interfaces on each router.

Step 5 Configure the routing protocol on the BHM router

a. Go to the proper command mode and enter the following:

```
BHM(config)#router rip
BHM(config-router)#network 192.168.2.0
BHM(config-router)#network 192.168.1.0
BHM(config-router)#exit
BHM(config)#exit
```

Step 6 Save the BHM router configuration

```
BHM#copy running-config startup-config
Destination filename [startup-config]? [Enter]
```

Step 7 Verify that the internetwork is functioning by pinging the ~~Fast~~Ethernet interface of the other router

a. From GAD, is it possible to ping the BHM router ~~Fast~~Ethernet interface? No

b. From BHM, is it possible to ping the GAD router ~~Fast~~Ethernet interface? Yes

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Step 8 Examine the routing table

a. After an unsuccessful ping, check the routing table with the **show ip route** command. From the GAD router, type the following:

```
GAD#show ip route
```

b. Is there a route to the BHM Ethernet LAN? No

```
GAD#show ip route
<output omitted>

Gateway of last resort is not set

C    192.168.1.0/24 is directly connected, Ethernet0
C    192.168.2.0/24 is directly connected, Serial0
```

Step 9 Examine the routing protocol status

a. After examining the routing tables, it is discovered that there is no route to the BHM Ethernet LAN. So use the **show ip protocols** command to view the routing protocol status. From the BHM router, type the following:

```
BHM#show ip protocols
```

b. What networks is RIP routing? 192.168.1.0 192.168.2.0

c. Are these the correct networks? No

```
BHM#show ip protocols
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 8 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Outgoing update filter list for all interfaces is
  Incoming update filter list for all interfaces is
  Redistributing: rip
  Default version control: send version 1, receive any version
    Interface         Send  Recv  Triggered RIP  Key-chain
    Serial0           1     1 2
  Automatic network summarization is in effect
  Routing for Networks:
    192.168.1.0
    192.168.2.0
  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.2.1           120      00:00:11
  Distance: (default is 120)
```

Step 10 Change the configuration to route correct networks

a. After examining the **show ip protocols** command results, it is noticed that the network on the Ethernet LAN is not being routed. After examining it further, it is found that there is a network that does not belong has been configured to be advertised. It is decided this is a typo, and it is necessary to correct it. Enter the router RIP configuration mode and make the appropriate changes. From the BHM router, type the following:

```
BHM#configure terminal
BHM(config)#router rip
BHM(config-router)#no network 192.168.1.0
BHM(config-router)#network 192.168.3.0
BHM(config-router)#^Z
```

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Step 11 Confirm RIP is routing the correct networks

a. Now confirm the new statement corrected the RIP configuration problem. So again type the **show ip protocols** command to observe what networks are being routed.

b. From the BHM router, type the following:

```
BHM#show ip protocols
```

c. What networks is RIP routing? 192.168.2.0 192.168.3.0

d. Are these the correct networks? Yes

```
BHM#show ip protocols
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 24 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Outgoing update filter list for all interfaces is
  Incoming update filter list for all interfaces is
  Redistributing: rip
  Default version control: send version 1, receive any version
    Interface         Send  Recv  Triggered RIP  Key-chain
    Ethernet0         1     1 2
    Serial0           1     1 2
  Automatic network summarization is in effect
  Routing for Networks:
    192.168.2.0
    192.168.3.0
  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.2.1           120      00:00:18
  Distance: (default is 120)
```

Step 12 Verify the routing table

a. Now having confirmed that the configuration problem is corrected, verify that the proper routes are now in the routing table. So again issue the **show ip route** command to verify that the router now has the proper route.

b. From the GAD router, type the following:

```
GAD#show ip route
```

c. Is there a route to the BHM LAN? Yes

```
GAD#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B -
BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    192.168.1.0/24 is directly connected, Ethernet0
C    192.168.2.0/24 is directly connected, Serial0
R    192.168.3.0/24 [120/1] via 192.168.2.2, 00:00:19, Serial0
```

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Step 13 Verify connectivity between GAD router and host in BHM

a. Use the **ping** command to verify connectivity from GAD router to a host in BHM.

b. From the GAD router, type the following:

```
GAD#ping host-ip
```

For example for host with IP Address, type the following:

```
GAD#ping 192.168.3.2
```

c. Was the ping successful? Yes

Upon completion of the previous steps, log off by typing **exit** and turn the router off.

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Erasing and reloading the router

Enter into the privileged exec mode by typing **enable**.

If prompted for a password, enter **class**. If “class” does not work, ask the instructor for assistance.

```
Router>enable
```

At the privileged exec mode, enter the command **erase startup-config**.

```
Router#erase startup-config
```

The responding line prompt will be:

```
Erasing the nvram filesystem will remove all files! Continue?
[confirm]
```

Press **Enter** to confirm.

The response should be:

```
Erase of nvram: complete
```

Now at the privileged exec mode, enter the command **reload**.

```
Router(config)#reloadRouter#reload
```

The responding line prompt will be:

```
System configuration has been modified. Save? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Proceed with reload? [confirm]
```

Press **Enter** to confirm.

In the first line of the response will be:

```
Reload requested by console.
```

After the router has reloaded the line prompt will be:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Press RETURN to get started!
```

Press **Enter**.

The router is ready for the assigned lab to be performed.

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Router Interface Summary					
Router Model	Ethernet Interface #1	Ethernet Interface #2	Serial Interface #1	Serial Interface #2	Interface #5
800 (806)	Ethernet 0 (E0)	Ethernet 1 (E1)			
1600	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)	
1700	FastEthernet 0 (FA0)	FastEthernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)	
2500	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)	
2600	FastEthernet 0/0 (FA0/0)	FastEthernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)	
In order to find out exactly how the router is configured, look at the interfaces. This will identify the type of router as well as how many interfaces the router has. There is no way to effectively list all of the combinations of configurations for each router class. What is provided are the identifiers for the possible combinations of interfaces in the device. This interface chart does not include any other type of interface even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in IOS command to represent the interface.					

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BHM with error

```
BHM#show running-config
Building configuration...

Current configuration:
!
version 12.0
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname BHM
!
enable secret 5 $1$iQzD$hHdQsscpbSdVj63u69J1X1
!
ip subnet-zero
!
interface Ethernet0
 ip address 192.168.3.1 255.255.255.0
 no ip directed-broadcast
!
interface Serial0
 ip address 192.168.2.2 255.255.255.0
 no ip directed-broadcast
 no ip mroute-cache
 no fair-queue
!
interface Serial1
 no ip address
 no ip directed-broadcast
 shutdown
!
router rip
 network 192.168.1.0
 network 192.168.2.0
!
ip classless
!
line con 0
 transport input none
line aux 0
line vty 0 4
 password cisco
 login
!
end
```

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BHM working

```
BHM#show running-config
Building configuration...

Current configuration:
!
version 12.0
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname BHM
!
enable secret 5 $1$iQzD$hHdQsscpbSdVj63u69J1X1
!
ip subnet-zero
!
interface Ethernet0
 ip address 192.168.3.1 255.255.255.0
 no ip directed-broadcast
!
interface Serial0
 ip address 192.168.2.2 255.255.255.0
 no ip directed-broadcast
 no ip mroute-cache
 no fair-queue
!
interface Serial1
 no ip address
 no ip directed-broadcast
 shutdown
!
router rip
 network 192.168.2.0
 network 192.168.3.0
!
ip classless
!
line con 0
 transport input none
line aux 0
line vty 0 4
 password cisco
 login
!
end
```

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```
GAD#show running-config
Building configuration...

Current configuration:
!
version 12.0
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname GAD
!
enable secret 5 $1$O3uG$CI4acFapdY8A8CylvUpKq.
!
ip subnet-zero
!
interface Ethernet0
 ip address 192.168.1.1 255.255.255.0
 no ip directed-broadcast
!
interface Serial0
 ip address 192.168.2.1 255.255.255.0
 no ip directed-broadcast
 no ip mroute-cache
 no fair-queue
clock rate 64000
!
interface Serial1
 no ip address
 no ip directed-broadcast
 shutdown
!
router rip
 network 192.168.1.0
 network 192.168.2.0
!
ip classless
!
line con 0
 transport input none
line aux 0
line vty 0 4
 password cisco
 login
!
end
```

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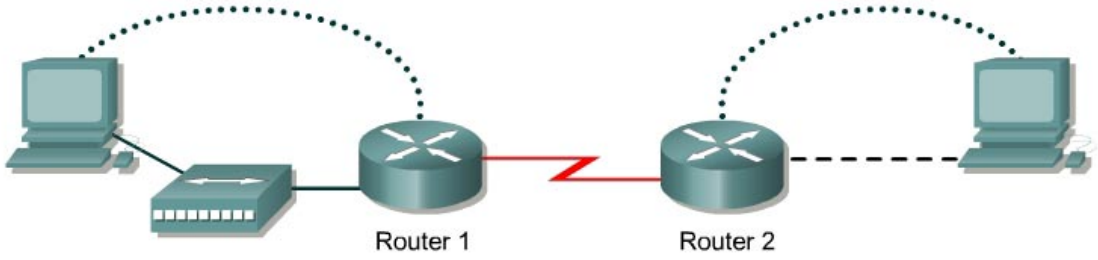
Lab 9.3.5 Troubleshooting Routing Issues with `show ip route` and `show ip protocols` – Instructor Version 2600



Router Designation	Router Name	Fast Ethernet 0 Address	Interface type	Serial 0 Address	Subnet mask for both interfaces	Enable secret password	Enable, VTY and console password
Router 1	GAD	192.168.1.1	DCE	192.168.2.1	255.255.255.0	class	cisco
Router 2	BHM	192.168.3.1	DTE	192.168.2.2	255.255.255.0	class	cisco

Objective

- Use the **`show ip route`** and **`show ip protocol`** commands to diagnose a routing configuration problem.

Background/Preparation

Cable a network similar to the one in the diagram. Any router that meets the interface requirements displayed on the above diagram, such as 800, 1600, 1700, 2500, 2600 routers, or a combination, may be used. Please refer to the chart at the end of the lab to correctly identify the interface identifiers to be used based on the equipment in the lab. The configuration output used in this lab is produced from 1721 series routers. Any other router used may produce a slightly different output. The following steps are intended to be executed on each router unless specifically instructed otherwise.

Start a HyperTerminal session as performed in the Establishing a HyperTerminal session lab.

Note: Go to the erase and reload instructions at the end of this lab. Perform those steps on all routers in this lab assignment before continuing.

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Step 1 Configure the hostname, passwords and interfaces on the GAD router

a. On the GAD router, enter the global configuration mode and configure the hostname as shown in the chart. Then configure the console, virtual terminal and enable passwords. If there is a problem doing this, refer to the Configuring Router Passwords lab. Configure interfaces as shown in the table.

Step 2 Configure the routing protocol on the GAD router

a. Go to the proper command mode and enter the following:

```
GAD(config)#router rip
GAD(config-router)#network 192.168.1.0
GAD(config-router)#network 192.168.2.0
GAD(config-router)#exit
GAD(config)#exit
```

Step 3 Save the GAD router configuration

```
GAD#copy running-config startup-config
Destination filename [startup-config]? [Enter]
```

Step 4 Configure the hostname and passwords on the BHM router

a. On the BHM router, enter the global configuration mode and configure the hostname as shown in the chart. Then configure the console, virtual terminal and enable passwords. Finally, configure the interfaces on each router.

Step 5 Configure the routing protocol on the BHM router

a. Go to the proper command mode and enter the following:

```
BHM(config)#router rip
BHM(config-router)#network 192.168.2.0
BHM(config-router)#network 192.168.1.0
BHM(config-router)#exit
BHM(config)#exit
```

Step 6 Save the BHM router configuration

```
BHM#copy running-config startup-config
Destination filename [startup-config]? [Enter]
```

Step 7 Verify that the internetwork is functioning by pinging the FastEthernet interface of the other router

a. From GAD, is it possible to ping the BHM router FastEthernet interface? No

b. From BHM, is it possible to ping the GAD router FastEthernet interface? Yes

Step 8 Examine the routing table

a. After an unsuccessful ping, check the routing table with the **show ip route** command. From the GAD router, type the following:

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```
GAD#show ip route
```

b. Is there a route to the BHM Ethernet LAN? No

```
GAD#show ip route
<output omitted>

Gateway of last resort is not set

C    192.168.1.0/24 is directly connected, FastEthernet0/0
C    192.168.2.0/24 is directly connected, Serial0/0
```

Step 9 Examine the routing protocol status

a. After examining the routing tables, it is discovered that there is no route to the BHM Ethernet LAN. So use the **show ip protocols** command to view the routing protocol status. From the BHM router, type the following:

```
BHM#show ip protocols
```

b. What networks is RIP routing? 192.168.1.0 192.168.2.0

c. Are these the correct networks? No

```
BHM#show ip protocols
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 8 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Outgoing update filter list for all interfaces is
  Incoming update filter list for all interfaces is
  Redistributing: rip
  Default version control: send version 1, receive any version
    Interface         Send  Recv  Triggered RIP  Key-chain
    Serial0/0           1     1 2
  Automatic network summarization is in effect
  Routing for Networks:
    192.168.1.0
    192.168.2.0
  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.2.1           120      00:00:11
  Distance: (default is 120)
```

Step 10 Change the configuration to route correct networks

a. After examining the **show ip protocols** command results, it is noticed that the network on the Ethernet LAN is not being routed. After examining it further, it is found that there is a network that does not belong has been configured to be advertised. It is decided this is a typo, and it is necessary to correct it. Enter the router RIP configuration mode and make the appropriate changes. From the BHM router, type the following:

```
BHM#configure terminal
BHM(config)#router rip
BHM(config-router)#no network 192.168.1.0
BHM(config-router)#network 192.168.3.0
BHM(config-router)#^Z
```

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Step 11 Confirm RIP is routing the correct networks

a. Now confirm the new statement corrected the RIP configuration problem. So again type the **show ip protocols** command to observe what networks are being routed.

b. From the BHM router, type the following:

```
BHM#show ip protocols
```

c. What networks is RIP routing? 192.168.2.0 192.168.3.0

d. Are these the correct networks? Yes

```
BHM#show ip protocols
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 24 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Outgoing update filter list for all interfaces is
  Incoming update filter list for all interfaces is
  Redistributing: rip
  Default version control: send version 1, receive any version
    Interface                Send  Recv  Triggered RIP  Key-chain
    FastEthernet0/0          1     1 2
    Serial0/0                1     1 2
  Automatic network summarization is in effect
  Routing for Networks:
    192.168.2.0
    192.168.3.0
  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.2.1           120      00:00:18
  Distance: (default is 120)
```

Step 12 Verify the routing table

a. Now having confirmed that the configuration problem is corrected, verify that the proper routes are now in the routing table. So again issue the **show ip route** command to verify that the router now has the proper route.

b. From the GAD router, type the following:

```
GAD#show ip route
```

c. Is there a route to the BHM LAN? Yes

```
GAD#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B -
BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    192.168.1.0/24 is directly connected, FastEthernet0/0
C    192.168.2.0/24 is directly connected, Serial0/0
R    192.168.3.0/24 [120/1] via 192.168.2.2, 00:00:19, Serial0/0
```

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Step 13 Verify connectivity between GAD router and host in BHM

a. Use the **ping** command to verify connectivity from GAD router to a host in BHM.

b. From the GAD router, type the following:

```
GAD#ping host-ip
```

For example for host with IP Address, type the following:

```
GAD#ping 192.168.3.2
```

c. Was the ping successful? Yes

Upon completion of the previous steps, log off by typing **exit** and turn the router off.

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Erasing and reloading the router

Enter into the privileged exec mode by typing **enable**.

If prompted for a password, enter **class**. If “class” does not work, ask the instructor for assistance.

```
Router>enable
```

At the privileged exec mode, enter the command **erase startup-config**.

```
Router#erase startup-config
```

The responding line prompt will be:

```
Erasing the nvram filesystem will remove all files! Continue?
[confirm]
```

Press **Enter** to confirm.

The response should be:

```
Erase of nvram: complete
```

Now at the privileged exec mode, enter the command **reload**.

```
Router(config)#reloadRouter#reload
```

The responding line prompt will be:

```
System configuration has been modified. Save? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Proceed with reload? [confirm]
```

Press **Enter** to confirm.

In the first line of the response will be:

```
Reload requested by console.
```

After the router has reloaded the line prompt will be:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Press RETURN to get started!
```

Press **Enter**.

The router is ready for the assigned lab to be performed.

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Router Interface Summary					
Router Model	Ethernet Interface #1	Ethernet Interface #2	Serial Interface #1	Serial Interface #2	Interface #5
800 (806)	Ethernet 0 (E0)	Ethernet 1 (E1)			
1600	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)	
1700	FastEthernet 0 (FA0)	FastEthernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)	
2500	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)	
2600	FastEthernet 0/0 (FA0/0)	FastEthernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)	
In order to find out exactly how the router is configured, look at the interfaces. This will identify the type of router as well as how many interfaces the router has. There is no way to effectively list all of the combinations of configurations for each router class. What is provided are the identifiers for the possible combinations of interfaces in the device. This interface chart does not include any other type of interface even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in IOS command to represent the interface.					

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BHM with error

```
BHM#show running-config
Building configuration...

Current configuration:
!
version 12.0
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname BHM
!
enable secret 5 $1$iQzD$hHdQsscpbSdVj63u69J1X1
!
ip subnet-zero
!
interface FastEthernet0/0
 ip address 192.168.3.1 255.255.255.0
 no ip directed-broadcast
!
interface Serial0/0
 ip address 192.168.2.2 255.255.255.0
 no ip directed-broadcast
 no ip mroute-cache
 no fair-queue
!
interface Serial0/1
 no ip address
 no ip directed-broadcast
 shutdown
!
router rip
 network 192.168.1.0
 network 192.168.2.0
!
ip classless
!
line con 0
 transport input none
line aux 0
line vty 0 4
 password cisco
 login
!
end
```

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BHM working

```
BHM#show ru
Building configuration...

Current configuration:
!
version 12.0
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname BHM
!
enable secret 5 $1$iQzD$hHdQsscpbSdVj63u69J1X1
!
ip subnet-zero
!
interface FastEthernet0/0
 ip address 192.168.3.1 255.255.255.0
 no ip directed-broadcast
!
interface Serial0/0
 ip address 192.168.2.2 255.255.255.0
 no ip directed-broadcast
 no ip mroute-cache
 no fair-queue
!
interface Serial0/1
 no ip address
 no ip directed-broadcast
 shutdown
!
router rip
 network 192.168.2.0
 network 192.168.3.0
!
ip classless
!
line con 0
 transport input none
line aux 0
line vty 0 4
 password cisco
 login
!
end
```


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```
GAD#show running-config
Building configuration...

Current configuration:
!
version 12.0
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname GAD
!
enable secret 5 $1$O3uG$CI4acFapdY8A8CylvUpKq.
!
ip subnet-zero
!
interface FastEthernet0/0
 ip address 192.168.1.1 255.255.255.0
 no ip directed-broadcast
!
interface Serial0/0
 ip address 192.168.2.1 255.255.255.0
 no ip directed-broadcast
 no ip mroute-cache
 no fair-queue
clock rate 64000
!
interface Serial0/1
 no ip address
 no ip directed-broadcast
 shutdown
!
router rip
 network 192.168.1.0
 network 192.168.2.0
!
ip classless
!
line con 0
 transport input none
line aux 0
line vty 0 4
 password cisco
 login
!
end
```


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